16:09:32 OCA PAD INITIATION - PROJECT HEADER INFORMATION 10/08/87

Active

Project #: B-10-643 Cost share #: B-10-355 Rev #: 0
Center # : R6399-0A0 Center shr #: F6399-0A0 OCA file #:
Work type : RES
Contract#: CDR-8715396 Mod #: Document : GRANT
Prime #: Contract entity: GTRC

Subprojects ? : N
Main project #:

Project unit: OIP Unit code: 03.010.106
Project director(s):
MCCRACKEN W M ICS

Sponsor/division names: NATL SCIENCE FOUNDATION / GENERAL
Sponsor/division codes: 107 / 000

Award period: 870801 to 890131 (performance) 890430 (reports)

| Sponsor amount | New this change | Total to date |
|---|---|---|
| Contract value | 100,000.00 | 100,000.00 |
| Funded | 100,000.00 | 100,000.00 |
| Cost sharing amount | | 1,000.00 |

Does subcontracting plan apply ?: N

Title: ESTAB OF AN INDUSTRY/UNIVERSITY COOPERATIVE RESEARCH CENTER IN INFO MGMT

PROJECT ADMINISTRATION DATA

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Security class (U,C,S,TS) : U
Defense priority rating :
Equipment title vests with: Sponsor GIT X

ONR resident rep. is ACO (Y/N): N
NSF supplemental sheet

Administrative comments -
PROJECT INITIATION

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

# NOTICE OF PROJECT CLOSEOUT

Date August 18, 1989

oject No. B-10-643 Center No. R6399-0A0

oject Director W. M. Cracken School/Lab OIP

onsor National Science Foundation

ntract/Grant No. CDR-8715396 GTRC XX GIT ____

ime Contract No. N/A

tle Establishment of an Industry/University Cooperative Research Center in Information Management

fective Completion Date 4/30/89 (Performance) 7/30/89 (Reports)

oseout Actions Required:

__ None
__ Final Invoice or Copy of Last Invoice
__ Final Report of Inventions and/or Subcontracts
__ Government Property Inventory & Related Certificate
__ Classified Material Certificate
__ Release and Assignment
__ Other _____

cludes Subproject No(s). _____

bproject Under Main Project No. _____

ntinues Project No. _____ Continued by Project No. _____

stribution:

__ Project Director
__ Administrative Network
__ Accounting
__ Procurement/GTRI Supply Services
__ Research Property Management
__ Research Security Services

__x__ Reports Coordinator (OCA)
__x__ GTRC
__x__ Project File
__x__ Contract Support Division (OCA)
____ Other _____

## 4. Research Programs

The CIMR research programs are aimed at spanning the many research areas encompassed by information management research. These include information and computer science, computer networks, local area networking, management information systems, decision support systems, artificial intelligence, audio-visual integration, graphics and many others.

The CIMR research programs have been classified according to the following scheme.

Information Management:

These research areas are concerned with the ultimate application of information systems, i.e., the organization and presentation of information and data. It also includes the related areas of management structures and approaches that support and foster the optimal delivery of information.

Information Engineering:

These research areas represent the supporting technologies for information systems. These include engineering solutions to the problem of delivering information (e.g., telecommunications and networking), designing the computer programs needed to process information (e.g., software engineering), developing advanced methods for representing and operating on information in intelligent ways (e.g., artificial intelligence), and providing technologically advanced schemes for presenting information (e.g., computer graphics).

Information Systems Design:

This research area is aimed specifically at the development of new tools, methods, and theories for improving and advancing the art and science of designing large-scale information systems. It is the synthesis of the information management and engineering research areas and the one that will contribute most directly to the production of new tools and technology.

### 4.1. University of Arizona: Information Management Research Program

This research program will be composed of four major program elements, each to be administered by the Department of Management Information Systems at the University of Arizona. In executing this research program, the Department of Management Information Systems will interface with many other campus and CIMR elements, including those available through the Department of Computer Science at Arizona.

#### 4.1.1. Group Decision Support

This program element deals with the methods and systems available to groups of decision-makers in organizations. Typical projects include the following:

- Elimination of Organizational Bias in Group Decision-Making. This project will examine the role that information technology can play in the elimination of group and organizational biases in the group decision making. An *Electronic Brainstorming System* will be used to demonstrate the means of bias elimination. The preliminary exploratory work has suggested the value of such tools in the private and public sectors.
- Integration of Planning Knowledge in Group Planning. Organizations have a large range of tools and techniques to utilize in the process of planning. This project will examine the potential for integration of the various knowledge fragments identified by a variety of tools into a single knowledge base containing the planning information.
- Assumption Surfacing and Stakeholder Identification. An important group decision making activity is the identification of those that have a stake in a particular decision and what the assumptions are that are held by these stakeholders. This project will examine several techniques for stakeholder identification and the follow-up assumption surfacing.

#### 4.1.2. Organization and Policy

This program element is concerned with improvements to the information management process that can be obtained by changes to the infrastructure. Typical projects include the following:

- o Effect of Interconnectivity on Organization Structure. This project will examine the impact of interconnectivity on various organizational structures. Electronic mail network participation and the process through which informal sub-nets are formed and evolve over time will be examined. The patterns of evolution of the informal logical sub-nets will also be examined.
- o Technology Transfer Issues in Software Technologies. Policies associated with the protection of the software market will be examined. The means and mechanisms for the introduction of monitors and controls in the management of software distribution in a world market will also be examined.

#### 4.1.3. Electronic Messaging

This program element is aimed at developing new tools and strategies for fully utilizing the power of electronic distribution of information within an organization. Typical projects include the following:

- o Localization of Pre- and Post-Transmission Message Management. The capability of off-loading message management to the local workstation information systems will be examined. The functional requirements of such a local service capability will be derived and an implementation described.
- o The Use of Intelligent Filters in Management of Electronic Messages. The use of a callable inferencing capability will be explored. Filters for message distribution, message reception and message monitoring will be examined. Such filters can be used to implement organizational and personnel policy.

#### 4.1.4. Information Center Management

This area is concerned with the management of information distribution and processing resources. Typical projects include:

- o A Migration Plan for the Evolution of Effective Information Centers. A phased migration will be proposed for the planning and development of an information center in the organization. The model will account for the nature and structure of the organization and industry.
- o An Expert System to Aid in the Determination of Available Information Center Resources. A system will be developed that aids the novice user in the information center in identifying the needed resources to complete a task.

### 4.2. Georgia Institute of Technology: Information Engineering Research Program

This research program in information systems is administered by the Office of Interdisciplinary Programs (OIP) at the Georgia Institute of Technology. In executing this program OIP will interface with many other campus organizations, including the following: the Software Engineering Research Center (SERC), the School of Information and Computer Science (ICS), the School of Electrical Engineering (EE) and the Georgia Tech Research Institute (GTRI). Since OIP has access to all related research on the Georgia Tech Campus, many research programs in addition to those described here are available to support the activities of the CIMR.

#### 4.2.1. Software Engineering

Many key information management issues are related to the development of software. Issues such as whether or not software-implemented functions are correctly and reliably implemented are often the main risk drivers in modern information systems. Software engineering is the application of engineering principles and concepts to the cost-effective design of computer software. Typical projects include the following:

- o Software Testing Methods and Tools. This project is aimed at developing a software development environment that is tailored to the full-scale testing of software such as might be found in information or communication systems. It uses high-bandwidth bitmap displays and other interface devices to ensure that large-scale testing tasks can be accommodated within a single environment.

- o Parsing of Internetwork Messages. This project will produce compiler-based tools for the processing of networked communications in representation-independent form. The resulting prototype systems will be useful demonstration vehicles for all information systems environments in which messages may arrive from a variety of heterogeneous and not necessarily consistent sources.

### 4.2.2. Telecommunications, Networking and Distributed Systems

The distribution of information to geographically dispersed sites and the effective utilization of related resources is a problem of key interest in information management research. Georgia Tech's telecommunications laboratory and network studies program, coupled with broadly based programs in distributed system design will provide an effective basis for research in this area. Typical Projects include the following:

- o The Clouds Distributed Operating System Project. The aim of this project is to design and build a reliable distributed operating system. It will provide a test bed for the evaluation of techniques for constructing distributed systems.
- o The Data Communications and Computer Networking Laboratory. This laboratory is a well-equipped research and instructional facility containing equipment covering the spectrum from analog and digital transmission to a complete multinode, store-and-forward, packet-switched system.

### 4.2.3. Artificial Intelligence and Knowledge-Based Systems

The increasing requirements for intelligent behavior on the part of information processing systems makes the use of artificial intelligence a necessary part of information management research. At Georgia Tech, this research is conducted by ICS as well as GTRI. Typical projects include the following:

- o Knowledge Representation. This effort is concerned with the organization, retrieval and acquisition of the experience-acquired knowledge necessary for reasoning. One early product of this area was the CYRUS system, a computer system that stored and retrieved information concerning events from the life of former Secretary of State Cyrus Vance. A newer application of this technology is the MEDIATOR system that uses experience to suggest plans for resolving disputes.
- o Expert Systems. One expert system project among the many being conducted at Georgia Tech is the *Tactical Expert System*. The goal of this system is to apply artificial intelligence methods to automatic target recognition. The focus here is on "image understanding" -- that is, on giving computers the ability to integrate contextual information into the process of machine vision.

### 4.2.4. Supporting Technologies

Due to the broad technology base demanded by information management research, many supporting technologies will be called upon in the execution of the CIMR's research program. The three technologies below have particular relevance to the CIMR mission and are supported by active and growing research and instructional programs.

- o Data Base Design and Analysis. Key projects in this area are related to designing methods for synchronizing and recovering the activity of multiple database users in the event of system failures, designing and implementing simulation tools for studying concurrent databases and database distribution problems such as might be encountered in airline reservation systems.
- o Computer Graphics and CAD/CAE. Projects which advance computer graphics or make extensive use of graphics capabilities include the CV-DESIGN system (a knowledge-based program designed for application to the conceptual design of systems) and image reconstruction using fractals, a mathematical method that can be used to produce, for example, geographic terrain images from satellite data.
- o Computer Security. The research in this area is aimed at providing methods for designing secure databases, computer systems and communication systems. One project is the design of a multilevel secure distributed system. The technologies use various encryption schemes as well as local area network technology.

### 4.3. Joint Research Program in Information Systems Design

This research program will be the area in which integration and synthesis of separate technologies is carried out. It capitalizes on the strengths of the respective University partners. Projects that have been undertaken in the past and are illustrative candidates for inclusion in the Joint Research Program include the following:

- o National Information Systems. This project's goal was the design of a national network of scientific and technical information services for Egypt. The major product of the first phase of the project was the structured design of the information network. The project involved the integration of distributed systems technology, policy and organizational approaches, database technology, information storage and retrieval methodologies, and the establishment of a nationwide training program.
- o Micro-based Workstations for Information System Design. This project will develop an architecture for a micro-based design workbench to assist in information systems design. Recent trends and emerging technologies can be exploited in the development of a facility to be used in the rapid development of effective information systems.
- o Dynamic Meta-Knowledge Mangement in Information System Design. This project will examine the potential and limits of using the more general knowledge-based approaches to retention of design information. A prototype will demonstrate the uses of dynamic meta-systems.

## 5. Test Bed and Facilities Plan

An innovative aspect of this proposal is the establishment and operation of a distributed test bed facility for use by CIMR researchers and the industrial affiliates. This facility will consist of an array of computer equipment, workstations, and communications equipment together with broadband communication facilities. These machines will be acquired either separately by each of the participating universities or jointly through funding acquired by the CIMR for facility support.

New technologies developed at CIMR will be installed in this facility. The use of the test bed will be open to all affiliates. Therefore, as a benefit of affiliation with CIMR, an industrial or government affiliate has early and unrestricted access to research prototypes and cutting edge technologies that are available in the facility. The detailed plans for acquiring, sharing, distributing and operating facility resources will be developed as part of the planning grant.

When completed, this facility will constitute an advanced, on-line reconfigurable distributed environment in which to demonstrate the utility of CIMR results, conduct experiments, and gather data for cost-benefit studies. Included among the items of major interest in this facility will be algorithms, methodologies, software, system prototypes, and tools for experimental research. The following are illustrative of the capabilities to be provided:

- o Execution of software against real and simulated loads
- o Recording and analysis of experimental data
- o Graphical display of experiment status, results, and reporting
- o Re-use and sharing of experimental tools and instrumentation
- o Controlled and reproducible manipulation of systems.

For example, the human factors project will produce a software tool called an "interface design advising tool". This tool will be of special interest in the design of user interfaces to information systems. An affiliate may access this tool in the CIMR facility and demonstrate the usefulness of such a capability using their own personnel and problem domain. It is intended that the mode of access be as flexibly structured as possible. The user can access the desired capabilities or data for which he/she has access rights and permissions. If the capability proves useful, then the affiliate can take the more expensive steps of acquiring the tool and physically incorporating it into their own environment. Another attractive use of the test bed will be for training technical personnel drawn from the affiliate's internal technical and managerial ranks.

The possibilities of using such a facility to speed up information and technology transfer from research groups to the affiliated organizations is quite exciting. We expect this capability to be a model for future ventures in technology transfer.

**6. Organization**

The overall organization of the CIMR is shown in Figure 1 above. The management structure will be as shown in Figure 2.

Georgia Tech has extensive experience in establishing centers of research such as the CIMR. The Office of Interdisciplinary Programs (OIP) at Georgia Tech is the organization under which the CIMR will be managed. OIP, which falls under the Vice-President for Research, is the parent organization to programs that require multidisciplinary resources. In addition, the CIMR will have access to the extensive resources of GTRI. GTRI is an organization on campus that conducts in excess of $80 million per annum of contract research. As such, it possesses the resources necessary to support a program such as the CIMR. These resources include as well as contract administration and research security, personnel to assist in the conduct of research for CIMR.

Two co-directors representing Georgia Tech and the University of Arizona will be responsible for the day to day management of the CIMR's research activities at each university and will ensure that the project is coordinated between the two universities. In addition, the Georgia Tech co-director will be responsible for the overall planning, coordination and management of the Center. The staff for the CIMR will be drawn from the academic and research faculties and graduate students of the two universities, and will be supplemented by visiting researchers from the industrial sponsors.

Two advisory boards, the University Policy Committee and the Industrial Advisory Board, will be formed to assist in the overall management of the CIMR. The University Policy Committee will review the CIMR plans and research programs to ensure that it is operating within the overall goals and policies of the Universities and that the resources necessary for successful operation of the Center are available to it. The University Policy Committee will be co-chaired by Frederick A. Rossini, the Director of OIP at Georgia Tech, and Kenneth R. Smith, Dean of the College of Business and Public Administration at the University of Arizona. Members will be composed of Deans of Colleges, Directors of Schools/Departments and Directors of Laboratories whose faculty are engaged in research in the Center. The Industrial Advisory Board (IAB) will consist of a representative of each industrial sponsor. They will review the proposed and current research directions of the CIMR and make recommendations for alternatives or additions, as may be necessary, to the co-directors. The industrial sponsors will also appoint program monitors to provide formal feedback to the Industrial Advisory Board. The monitors are usually experts in the fields of interest to their companies and will work closely with the Center researchers. The monitors responsibilities are to provide technical input to the projects to insure that the projects are addressing the sponsor's needs, and to be the technical facilitator to transition the research results to the sponsor's organization.

The IAB will meet twice annually to review current and proposed research projects. The review will include critiques of the research that is underway, as to its relevance, direction and focus to the needs of the industrial sponsors. Proposed projects will be reviewed for technical relevance, financial requirements and schedule for recommendation to the Co-directors as to whether the projects should be included in the research program of the Center.

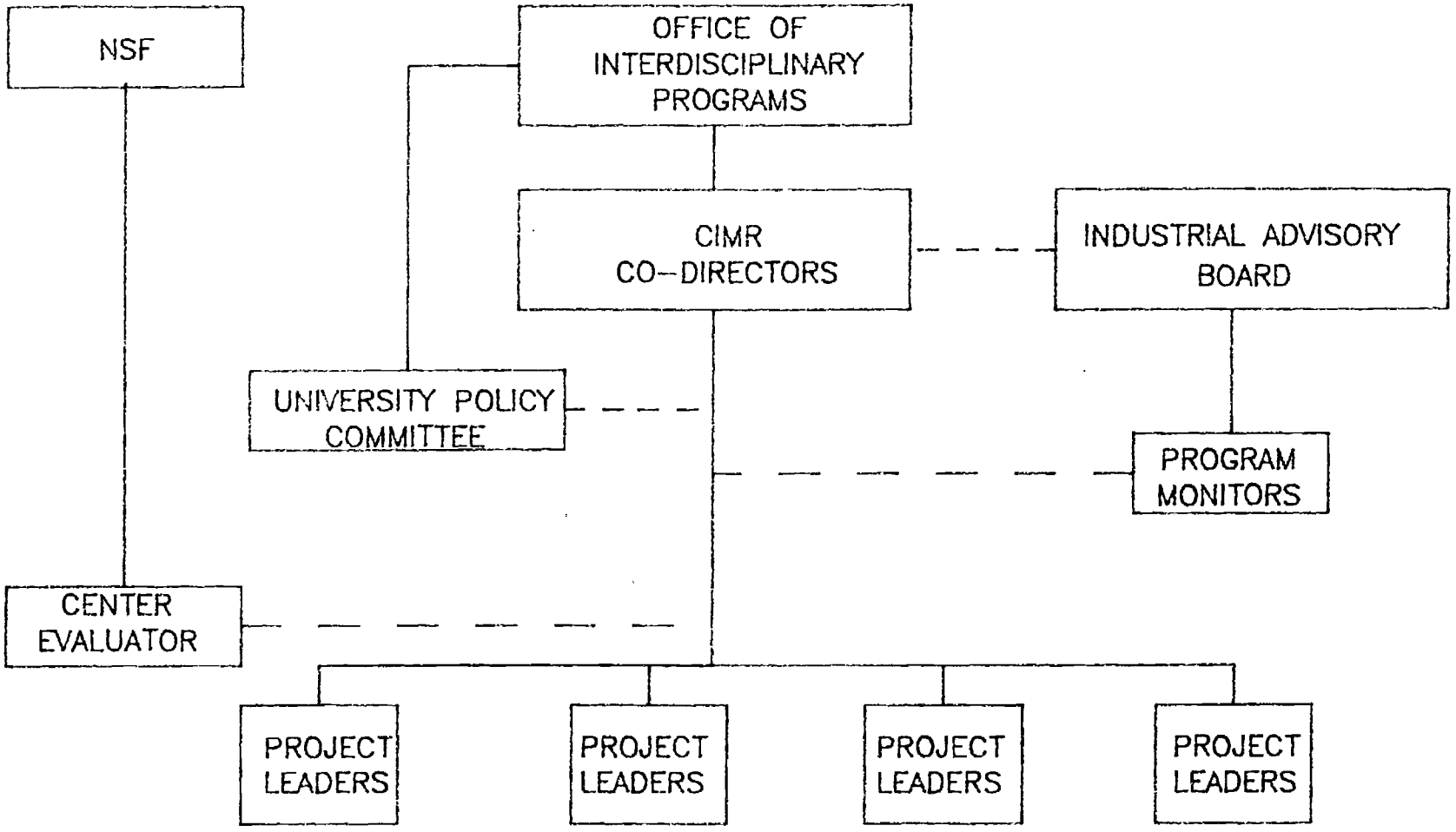


Figure 2.
CIMR Management Structure

## 7. Project Activities

Project activities have been broken into three phases:

- Phase I was a *Center Organization* activity which was conducted over a twelve month period. During this period, the administrative structure of the Center was formalized, and an initial set of industrial sponsors was brought into the project. This was accomplished with a center introductory meeting held in Atlanta, GA. in the summer of 1988. This set of sponsors is listed in Appendix D.
- Phase II will be a *Center Operational* activity. This phase will start on January 1, 1989 and will last for five years. It will be the period of formation and growth of the Center. During this period additional industrial sponsors will be brought into the Center each year, and a full complement of research and service activities will be undertaken.
- Phase III will be a *Self Sufficient* phase. This period will be characterized by a stable level of activity, a full complement of research and service activities, and full funding by sponsors.

The following specific activities were accomplished during the Center Organization phase:

1. Alternative organizations related to the Center were reviewed to assist in establishing the Center project offices at Georgia Tech and the University of Arizona.
2. The Center Co-directors met with potential industrial sponsors to formulate preliminary research programs of mutual interest. This was accomplished with the center formation meeting that was held in Atlanta, GA and with individual meetings with potential sponsors throughout the United States.
3. Meetings with each University's administration and potential industrial sponsors to support the preliminary planning for the Center were held.
4. Policies for CIMR membership, ownership of results, and project selection were established.
5. The University and Industrial Advisory Boards were established in a preliminary form, in anticipation of establishment of the Center.
6. Existing centers' marketing plans were reviewed and used in the development of the CIMR's marketing plans and materials. A complete brochure, prospectus, and sponsor agreement were developed.

## 8. Center Contractual Arrangements

It is proposed that the Georgia Institute of Technology act as the prime contractor on this project. Georgia Tech will then subcontract with the University of Arizona for its portion of the project's activities. A Research Agreement that has been approved by both University's administrations has been developed and is included as Appendix A in this proposal.

## 9. Center Evaluation Plan

In addition to the functions of the Industrial Advisory Board and the University Policy Committee, Center operations will be reviewed by an independent NSF sponsored evaluator. This evaluator is responsible for ensuring that the goals and objectives of the Center are being met. It is anticipated that the evaluator will be Dr. John Kaatz, Professor of Management in the College of Management at Georgia Institute of Technology. Dr, Kaatz is currently the evaluator for the NSF sponsored Materials Handling Research Center. Dr. Kaatz will also be responsible for collecting data which will be used by the NSF to evaluate the overall effectiveness of the Industry/University Cooperative Research Program.

## 10. Center Operating Procedures

### 10.1. Calendar

The following is a proposed calendar of events for the CIMR. The IAB and University Policy Committee may recommend modifications to the calendar and will fix the specific dates of the meetings in concert with the NSF. The calendar is based on conducting IAB meetings semi-annually, producing

an annual report and ensuring that the program is reviewed by the University Policy Committee prior to the IAB meeting. The winter IAB meeting will typically be held at the University of Arizona and the summer IAB meeting will be held at the Georgia Institute of Technology.

Annual CIMR Calendar of Events

January - University Policy Committee Meeting

February - IAB Meeting - University of Arizona

July - University Policy Committee Meeting

August - IAB Meeting - Georgia Institute of Technology

December - Annual Report Due

### 10.2. University Policy Committee Meetings

The University Policy Committee will meet approximately one month prior to each IAB meeting. The Committee will review Center operations prior to each IAB to ensure that the Center is operating within the policies of each university and to insure that the resources of the universities are being effectively used to support the goals and objectives of the Center.

### 10.3. Industrial Advisory Board Meetings

The IAB meets semi-annually to review the previous six months research results, and to review and recommend research projects for the following six months. In addition, the IAB can recommend changes to the operating policies of the Center.

At the first IAB meeting the sponsor representatives will recommend a set of projects to be funded in the first year of operation of the Center. It is also recommended that the IAB elect a chairperson to facilitate its deliberations and consolidate its recommendations.

### 10.4. Annual Report

The Center will produce an annual written report of the previous years activities. The report will include a summary of the research results, the recommended projects for the following year, and a summary of the financial operations of the Center. The report will be treated as CIMR proprietary and will not be distributed beyond the member companies for at least six months after publication.

### 10.5. Meetings with Industry Monitors and CIMR Researchers

Informal interchanges between Industry Monitors and CIMR staff are encouraged. These meetings are the vehicles to technically review the research progress, understand those results, and to aid in transitioning the technology to the industrial partner's environment.

### 10.6. Projects Outside the Scope of the Center

Any member company may negotiate a separate contract with the Georgia Institute of Technology or the University of Arizona to perform research that is outside the scope of the CIMR or that is corporate particular. These projects can be extensions of CIMR research or "spin off" projects that tailor CIMR research to a specific need.

### 10.7. Consulting Arrangements

Consulting agreements between sponsoring companies and university faculty are encouraged by the CIMR, but must be approved through regular university procedures. The CIMR will not undertake projects deemed to be consulting in nature.

### 10.8. Research on Member Companies Premises

CIMR research staff may perform research on the premises of member's plants if it is found to be desirable to do so by the IAB and the CIMR co-directors.